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Hydrate Fractionation Desalination and Water Purification

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Summary

Marine Desalination Systems, LLC (MDS) is engaged in a research and development program to introduce a new technology for large-scale desalination of seawater. Hydrate fractionation desalination, which is described in two patents held by the U.S. Navy (Naval Research Laboratory), is based on allowing the ice-like material gas hydrate to form through the injection of a gas or gas mixture into seawater at suitable pressure-temperature ranges. When the hydrate (which is composed of an open lattice-work of water molecules stabilized by van der Waals bonding with molecules of gas held in 'guest' sites in the lattice) forms, water molecules are extracted from the water or other water being treated. The hydrate concentrates under the force of gravity. When it dissociates because of reaching pressure-temperature conditions under which it is unstable, fresh water is produced and the hydrate-forming gas can be captured and largely reused. Marine-based, land-based, and pressurized apparatus are envisaged by MDS. Experiments suggest that polluted water can be desalinated directly, with little or no filtering or other preparation.